Reducing the Nutrient Impacts From On-Site Sewage Disposal Systems

A Report by the On-Site Sewage Disposal Task Force
An Initiative of Maryland's Tributary Teams
February-July 1999

Presented to Governor's Chesapeake Bay Cabinet
September 10, 1999

ACKNOWLEDGMENTS

Many people contributed to the success of this Task Force, an initiative of the Maryland Tributary Strategy Teams. Tom Miller, Chair of the Upper Potomac Tributary Strategy Team, chaired the On-Site Sewage Disposal System (OSDS) Task Force. The multi-constituency OSDS Task Force included over 40 participants from various sectors including: Maryland's Tributary Strategy Team Members, County health departments, County planning agencies, financial experts, State regulatory representatives, OSDS installers, system developers and inventors, engineers, haulers and educators. Facilitator Doug Brookman, from Public Solutions, proved to be extremely valuable in moving the Task Force efficiently through a number of complicated issues. The hard work of the drafting committee (Meo Curtis, Beth Hickey, Ken Hranicky, Danielle Lucid, Paul Meyer, Tom Miller, Anne Pearson, Catherine Pieper Stevenson, and Lauren Wenzel), helped to capture the viewpoints of the whole Task Force in this report.

There was a great deal of enthusiasm generated by the participants of the Task Force as they helped identify the challenges presented by on-site waste disposal systems and the policies that would shape their role in Maryland's future. Support from Governor Parris Glendening and from the Chesapeake Bay Cabinet Secretaries raised the level of commitment for those participants involved.

Thanks go to the visiting speakers who shared their time and expertise with us: John Halperin from Nature Works and Anish Jantrania, Ph.D., P.E., from Virginia's Department of Health.

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ABOUT THE ON-SITE SEWAGE DISPOSAL SYSTEM TASK FORCE

The Maryland Tributary Teams

Maryland's Tributary Strategy Teams were formed and appointed by the Governor in September of 1995. Charged with reducing nutrient pollution in the waters of the Chesapeake Bay's watershed, the Teams focus on reducing both nitrogen and phosphorus from a variety of pollution sources. Maryland is divided into ten major watershed basins with one Team focused on each basin.

The Middle Potomac Tributary Team became aware that revised On-site Sewage Disposal System (OSDS) regulations were soon to be submitted for public comment by the Maryland Department of the Environment (MDE). Members of the Upper Western Shore, Patuxent and Middle Potomac Tributary Teams met with representatives of MDE, the Washington Suburban Sanitary Commission, and Montgomery County to review the direction that MDE would take regarding septic system regulations. The Teams wished to encourage the use of technologies that reduced nutrients while also hydraulically removing pathogenic waste water and, therefore, proposed the creation of a broad-based Task Force to the Governor's Chesapeake Bay Cabinet in October 1998. The Cabinet endorsed the idea and asked that the Tributary Team representatives report back to them with the OSDS Task Force recommendations at the completion of their work in September 1999.

The OSDS Task Force convened their first meetings in February 1999 and subsequently provided comments on MDE's draft regulations, which were due by Spring 1999. After the regulatory comments were submitted to MDE, the OSDS Task Force broke into three workgroups focusing on education, traditional or "conventional" OSDS systems, and non-traditional OSDS systems. A drafting committee summarized the workgroup reports and the full OSDS Task Force reviewed and reached consensus on the final draft in August 1999. The Task Force has concluded its work and plans to report its findings and recommendations to the Chesapeake Bay Cabinet on September 10, 1999.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The cumulative impact of septic systems, or on-site sewage disposal systems (OSDS), on water quality and on Smart Growth initiatives is becoming a major concern in Maryland. This Task Force was formed, as an initiative of Maryland's Tributary Strategy Teams, to identify management practices and policies needed to reduce OSDS impacts to protect public health, the health of the environment, and the overall quality of life in Maryland. The Task Force agreed that despite some uncertainties associated with their impacts, OSDS are discharging nitrogen to groundwater that will ultimately reach tidal waters, and which poses an immediate threat to drinking water in some areas.

Key Recommendations:
After review and discussion of a wide range of technical and policy issues relating to on-site systems, the Task Force came to consensus on recommendations that:

- identify areas within the State that need immediate protection from OSDS impacts, called Areas of Special Concern;

- outline management districts and management agreements that should be required for Areas of Special Concern, community and shared systems, and newly installed or shared systems that utilize non-traditional technologies;

- broaden existing educational efforts to more effectively reach homeowners, local governments, and other key audiences;

- call for the training and licensing or certification of OSDS inspectors, haulers, and installers;

- require inspections of existing OSDS at the time of real estate transfer, expansion, and change of use;

- call for immediate measures to address the problems of communities with widespread septic system failure;

- encourage the widespread adoption of non-traditional systems, and ensure that they function properly; and

- encourage the use of shared systems with nutrient reduction in areas consistent with Smart Growth.

The recommendations are listed in full immediately following this Summary.

Future Challenges
The Task Force came to consensus on many key issues. Due to its short, six-month tenure, the Task Force raised associated issues that it was not able to resolve due to time restraints. These

included:

- Impact of OSDS on growth patterns
- Implementing Areas of Special Concern
- Future Use of Conventional Septic Systems
- Future Use of Community and Shared Systems
- Environmental Benefits of OSDS versus Wastewater Treatment Plants
- Incentive-based approaches
- Impacts of Deep Trench Systems
- Monitoring and Assessment
- Cumulative Impacts

The Task Force will present its findings to the Governor's Chesapeake Bay Cabinet in September. At the completion of this study, a new, policy-level committee, the Governor's Septic Systems Advisory Committee, had convened for the first time to review and consider the recommendations of this Task Force and the work of other groups. The Governor's Septic Systems Advisory Committee will subsequently make recommendations for Executive and Legislative action on OSDS management**.**

SUMMARY OF TASK FORCE RECOMMENDATIONS

This section summarizes the recommendations based on the findings of the Task Force. A detailed description of a proposed management framework with which to implement many of these recommendations is outlined in Chapter 3. Detailed recommendations on the definition of Areas of Special Concern are outlined in Chapter 2. Each recommendation includes a reference to further discussion within the body of this report.

OVERARCHING ISSUES

1. *Ten types of areas within the State need immediate protection from pollutant impacts from on-site systems. These areas are defined in Chapter 2, Areas of Special Concern. MDE should work with local governments and other agencies to establish guidelines for identifying additional Areas of Special Concern. (Non-traditional Systems, Concern 6).*

2. *MDE should require management districts or maintenance agreements for Areas of Special Concern, community and shared systems; and for newly installed or shared systems which utilize non-traditional technologies. A framework with recommended options is included in Chapter 3. (Areas of Special Concern; Shared Systems, Concern #2).*

3. *MDE, in cooperation with local governments and management entities should develop and institutionalize a tracking database to better assure proper maintenance and operation of OSDS. (Non-traditional systems, Concern # 3).*

EDUCATION

4. *Expand existing educational efforts to increase understanding among property owners, bankers, Realtors, and other key audiences of the cumulative impact of OSDS systems on watershed functions, and the need for responsible actions by property owners. (Education, Concerns #1, and 10).*

5. *MDE should expand its OSDS web site with information on non-traditional systems, educational materials, training, class listings, a list of certified persons (haulers, contractors and inspectors) and links to other resources. (Education, Concerns #1 and 10).*

6. *At least three demonstration areas should be created as a tool for education, outreach and promotion of new OSDS technologies, and their impacts on groundwater. These should be located on the Eastern Shore, in the Western Shore Coastal Plain, and in the Piedmont, so that the systems can demonstrate how they function under different geologic and hydrologic conditions. (Education, Concerns #2 and 3).*

7. *Expand assistance to local governments on non-traditional systems, including: overall technical assistance, and working with service providers such as Maryland Environmental Service, builders and haulers. A major focus should be increasing awareness of non-traditional technologies that provide additional environmental benefits. (Education, Concerns #3 and 4).*

Training, Certification and Disclosure

8. *MDE should require OSDS inspectors to be certified. Recent legislation requires inspectors to attend an MDE approved training course; this requirement should be expanded to require inspectors to pass an examination to demonstrate their knowledge of approved practices and procedures, and to complete continuing education requirements every three years. This procedure could be fee-based, and therefore self-supportive. (Education, Concern #5).*

9. *MDE should require septage haulers to be licensed and trained. Haulers should be required to report the amounts pumped out and delivered to wastewater treatment plants to local governments, and to the property owner. Training would involve proper inspection procedures, pumping technique, and how to fill in the reporting form. This procedure could be fee-based, and therefore self-supportive. (Education, Concern #6).*

10. *MDE should require OSDS installers to be certified. The certification should indicate the types of system that the company plans to install. This procedure requiring legislation, could be fee-based, and therefore self-supportive. (Education, Concern #7).*

11. *MDE should require a formal disclosure process and education program to accompany any transfer of property with an OSDS. This disclosure should be made prior to the actual settlement date, and should be included in the sales contract of the property. (Education, Concerns #8, 9 and 10).*

CONVENTIONAL SYSTEMS

Inspections

12. MDE should require owners to obtain an operational permit for an OSDS. (Conventional Systems, Concern #1).

13. I*nspections of conventional OSDS should be required at the time of real estate transfer, expansion, change of use, or as a renewal of an operational permit. (Conventional Systems, Concern #1; Education, Concerns #8 and 9).*

14. *A complete inspection should include a pump out. (Conventional Systems, Concern #1).*

Communities with Widespread Septic System Failures

15. *A management district should be required in communities where many systems need to be replaced. Costs of these systems for low-income residents could be addressed through a combination of grants, low-interest long-term loans, and subsidized maintenance fees. (Conventional Systems, Concern #2; Non-Traditional Systems, Concern #2).*

16. *Replacement systems for communities with widespread septic system failures should be with non-traditional (nutrient reduction) systems. (Conventional Systems, Concern #2).*

17. *Resolving the environmental and public health threats from these systems needs immediate attention. The Task Force recommends having replacement non-traditional systems in place for these communities (which are recommended as an Area of Special Concern) by 2010, or ten years after they are listed. (Conventional Systems, Concern #2).*

18. *Establish a policy level task force of state and local representatives to identify these communities*. This group will organize technical, community development and financial assistance to these communities. Maryland Rural Development Corporation, Department of Housing and Community Development, Federal Rural Development, and MDE are involved in this issue, but a concerted effort to coordinate the delivery of their programs is needed. *(Conventional Systems, Concern #2).*

19. *Establish a Technical Team of federal, state, local and private experts to analyze the best onsite and small community systems that could work for these communities*. Maryland could be a statewide pilot for a federal partnership to address these issues. *(Conventional Systems, Concern #2).*

20. *Develop new funding approaches for both capital and operations and maintenance expenses*. For example, some states are setting aside a small percentage of repayments to their SRF to be used to subsidize maintenance in the poorest communities. *(Conventional Systems, Concern #2).*

Adding Nutrient Reduction Technology

21. *Mandatory addition of nutrient reduction technology for existing OSDS should be required for replacements, upgrades or property transfers in Areas of Special Concern. (Conventional Systems, Concern #3).*

22. *Financial assistance should be made available for the capital costs of adding nutrient reduction technology to existing properties with OSDS in Areas of Special Concern. (Conventional Systems, Concern #3; Non-Traditional Systems, Concern #2).*

23. *MDE should identify regulatory opportunities for low-cost improvements to existing conventional systems while the State is in transition toward implementing more non-traditional, nitrogen removing systems. (Conventional Systems, Concern #4).*

NON-TRADITIONAL SYSTEMS

24. Clearly written, codes and regulations are needed for Maryland. MDE must continue to support the application of non-traditional systems. State and local governments must continue to cooperatively work together to develop OSDS policy. (Non-traditional Systems, Concern #1).

25. *MDE should adopt a verification process to ensure that a given new technology or product can perform as claimed, and should provide this information to all local governments. A recommended verification process is explained in Appendix A. (Non-traditional systems, Concern #3).*

26. MDE should adopt a monitoring process to ensure the ongoing performance of new OSDS technologies and products as detailed in Appendix A. (Non-traditional systems, Concern #3).

27. Maintenance agreements should be required for all non-traditional systems. Property owners may be certified to maintain their own systems with appropriate training, bonding, and liability. (Non-traditional systems, Concern #4).

28. MDE, in cooperation with local governments and management entities should develop and institutionalize a tracking database to better assure proper maintenance and operation of OSDS. This system would be maintained at the county level in a format standardized statewide, and would be designed to collect information such as the number and distribution of OSDS within a jurisdiction or defined maintenance area; watershed location; system type; problems and performance; sources of sewage; site and soil conditions; and housing or flow densities. This type of information could ensure that maintenance requirements are met, to direct the establishment of a new sanitary district or to predict when new resources are needed.

29. The implementation of non-traditional systems should not be allowed to make a lot buildable that is non-buildable under current regulations, except if it is in a designated growth area. (Non-traditional systems, Concern #6).

30. Financial assistance should be made available for the capital costs of adding nutrient reduction technology to existing properties with OSDS in Areas of Special Concern.

31. *A management district should be required in communities where many systems need to be replaced. Costs of these systems for low-income residents could be addressed*

through a combination of grants, low-interest long-term loans, and subsidized maintenance fees.

SHARED SYSTEMS

32. *County water and sewer plans should incorporate policies for utilizing shared facilities as an element of implementing their growth management/master plan. The plan would identify areas where shared facilities would be encouraged as well as areas where they would be discouraged. (Shared Systems, Concern #1)*

33. *MDE and local governments, including those that are involved in approving and managing shared facilities, should explore barriers to the use of these facilities -- including operations, maintenance and financial issues -- and identify options for making them more viable under Smart Growth guidelines. (Shared Systems, Concern #1)*

34. *MDE should require the establishment of management districts or maintenance agreements for shared systems. A framework with recommended options is included in Chapter 3. (Shared Systems, Concern #2)*

35. *Require nutrient reduction technologies for all new shared facilities. (Shared Systems, Concern #3)*

36. *Review the community facilities regulations and shared use facility regulations and revise as necessary to remove inconsistencies. (Shared Systems, Concern #4)*

CHAPTER 1
INTRODUCTION

The cumulative impact of septic systems, or on-site sewage disposal systems (OSDS), on water quality and on Smart Growth initiatives is becoming a major concern in Maryland. Compared with Maryland's nationally recognized efforts to address discharges from wastewater treatment plants and agricultural lands, septic system discharges have received scant attention. This Task Force was formed, as an initiative of Maryland's Tributary Strategy Teams, to identify management practices and policies needed to reduce OSDS nutrient impacts and to ensure that public health, the health of the environment, and the overall quality of life in Maryland is protected. The Task Force agreed that, despite some uncertainties associated with their impacts, OSDS are discharging nitrogen to groundwater that will ultimately reach tidal waters, and which poses immediate potential threats to drinking water in some areas.

Around the country, over the past two decades, manufacturers, government agencies and others have worked to develop and implement alternative OSDS that can address the treatment limitations of conventional systems. Alternative, or *non-traditional*, systems have been developed that remove nitrogen and can operate in soils that do not "perc." These treatment and siting attributes can be of tremendous value in protecting groundwater, but necessitate better defined planning efforts to ensure that non-traditional systems are not used to enable unwanted development.

Property owner involvement in maintaining OSDS is critical. Focusing homeowners' interest and providing timely and continued education in proper maintenance of OSDS is crucial. Some studies have shown that failure rates are about 20% for conventional technologies, and about 40% for more advanced technologies (such as pressure pipes and sand mounds) when maintenance is left to the property owner.[1,2] For this reason, the Task Force conceived a central role for management districts and management agreements. It is in the interest of all people in Maryland that OSDS nutrient loading to the environment be minimized to the greatest extent possible. It is the State's obligation to ensure that public health, the health of the environment, and overall quality of life is protected. Initiatives that reduce nutrient loads from OSDS are best encouraged and accomplished through the policies and actions taken by state and local governments.

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[1]Hoover, M.T and A. Amoozegar, 1989. Performance of alternative and conventional septic systems. In: Proceedings of Sixth Northwest On-Site Wastewater Treatment Short Course, pp. 173-203, University of Washington, Seattle, Washington.

[2]Hoover, M.T., R.O. Evans, T.H. Hinson, and R.C. Heath, 1993. Performance of sand lined trench septic systems on wet, clayey soils in northeastern North Carolina. Final Project Report for Div. Environ. Management, NCCDEHNR. College of Agriculture and Life Sciences, NCSU Raleigh, NC.

This report contains specific recommendations to:

– facilitate the use of non-traditional systems,

– address maintenance requirements of all OSDS,

– provide maximum feasible pollutant removal by OSDS, and

– ensure that planning and management for OSDS is consistent with Maryland's Smart Growth goals.

Statewide, there are over 400,000 OSDS, serving one in five Maryland households. Most of these are conventional OSDS, which are designed to remove solids and pathogens from wastewater in order to protect public health. Some systems, however, are not functioning properly due to age, neglect in operation and maintenance, or improper siting and installation. With an estimated failure rate of 1 to 5% each year, and thousands of new conventional systems being installed each year, the human health and water quality threat from OSDS becomes significant.[3] The US Environmental Protection Agency reports that OSDS effluent is frequently cited as a source of drinking water contamination nationwide.[4,5] Septic system effluent is also high in nitrogen, a major threat to the Chesapeake and Coastal Bays, other tidal waters, and reservoirs. By today's standards, past siting and installation practices provide inadequate treatment. New technologies are now available, and standards are urgently needed to improve the quality of effluent being discharged.

Estimates of nutrient loads from septic fields vary greatly, and should be viewed as "ballpark" estimates. The amount of the total nitrogen removed within the septic tank, in the drain field, and in the soil buffer is site specific. Other questions include how much nitrogen is removed by plant uptake, or is transported to deeper aquifers. Maizel reports that in some estimates as much as 30% of the nitrogen in Maryland groundwater in coastal zones comes from OSDS, others have tended to minimize septic fields as a major source within the basin.[6] For example,

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[3]Personal communication, Maryland Department of Environment Water Resources Administration, July 1999, Baltimore, MD.

[4]US Environmental Protection Agency, The Quality of Our Nation's Water: 1996. EPA 841-97-001, April 1998, Washington, D.C.

[5]US Environmental Protection Agency, "The Report to Congress: Waste disposal Practices and Their Effects on Ground Water," US EPA 570/9-77-001, pp. 294-321. June 1977, Washington, D.C.

[6]Maizel, Margaret, et al. The Potential for Nutrient Loading from Septic Systems to Ground and Surface Water Resources to the Chesapeake Bay. US Environmental Protection Agency, April 1997.

the Chesapeake Bay Program, using census data and standardized estimates of nutrient loading, estimates that 7.7 million pounds of nitrogen enter the Chesapeake Bay from OSDS each year. This represented about 6% of Maryland's nitrogen load in 1996. According to these estimates, OSDS loadings in Maryland's tributary basins range from 3% in the Choptank and Lower Eastern Shore to 19% in the Lower Western Shore.[7]

Failing OSDS pose an additional set of threats to water quality. The average life of a septic system is 12 to 20 years, and many older systems are no longer functioning properly. Lack of maintenance and improper installation often contribute to early septic system failure. When OSDS become clogged, they block the flow of discharge to the . Raw sewage backs up onto the surface of a yard or into a home, posing a direct threat to public health, as well as to surface and groundwater. In Maryland there are nearly 30,000 households with acknowledged failing OSDS. This does not include the many older OSDS that while not hydraulically failing, do not provide adequate nutrient reduction treatment.

The rate of growth in conventional OSDS is also a concern. The Maryland Office of Planning has stated that current trends will mean an additional 100,000 new OSDS in place by the year 2020. Conventional OSDS are associated with low density, sprawl development because they require large lots to accommodate the drainfield and a future replacement field. According to the Maryland Office of Planning, in 1990, residential parcels served by OSDS accounted for only 19% of all households in Maryland but more than 65% of residential land. This low density development increases the need for new roads and other public services, increases vehicle miles traveled, and speeds the loss of natural areas and valuable cropland.

[7]Data from the Chesapeake Bay Watershed Model cited in Maryland's Tributary Team Annual Report 1998. Maryland Department of Natural Resources, January 1999.

A QUESTION OF EQUITY

All citizens of Maryland contribute to nutrient reduction efforts through taxes which help support programs such as the Maryland Biological Nutrient Removal (BNR) Cost Share Program for wastewater treatment plants and the Maryland State Revolving Fund (SRF) Loan Program. As a result, over 90% of the flow from Maryland's wastewater treatment plants is, or soon will be, treated for nutrient reduction through biological nitrogen removal (BNR). Individuals served by public sewer make additional contributions through their quarterly sewer bill, which directly supports the operations of their local wastewater treatment plant. Typical effluent nitrogen concentration from plants with BNR technology are approximately 8 mg/liter. By contrast, conventional septic system effluent typically ranges from 35-100 mg/liter.*

A major tenet of the Chesapeake Bay restoration effort is that all citizens must do their share to reduce nutrient loads. Should On-site Sewage Disposal System (OSDS) users be required to pay the additional costs to upgrade their OSDS to make them less polluting and make them perform at the same level as Maryland's waste water treatment plants? In order for OSDS owners to improve the treatment of their effluent and contribute to the restoration of Maryland's Bays and tributaries, better design, management and operation of their systems will be needed.

Equity and cost effectiveness must be considered in evaluating options to achieve nutrient reductions, which might include assessing fees to property owners through management agreements, or by providing assistance to low-income property owners. Fee-based management will help ensure that OSDS users do their fair share to help protect and restore our waters.

*US Environmental Protection Agency, "Design Manual, Onsite Wastewater

About This Report

In this report, Areas of Special Concern, which require immediate attention and are referred to throughout this report are pivotal to our recommendations, and are defined in Chapter 2, in order to give context to the discussion that follows in later chapters. This is followed by Management Districts, Chapter 3, which suggests a structure for the implementation of many recommendations dealing with inspection, maintenance, and monitoring. Following this chapter are chapters on Education, Conventional systems, Non-traditional systems, and Shared systems. For each of these chapters, the Task Force outlined major concerns, findings, and recommendations. Task Force recommendations are extracted from each of the Chapters and are summarized immediately following the Executive Summary. Supporting information is included in appendices.

CHAPTER 2
AREAS OF SPECIAL CONCERN

The members of the Task Force agree that certain areas throughout the State urgently need additional measures to reduce nitrogen entering groundwater or nearby waterways. The Task Force refers to these pivotal areas as "Areas of Special Concern". Using non-traditional systems in these areas would provide enhanced removal of nitrogen and oxygen demanding materials and solids, which would provide additional human health and environmental protection. Please see: Future Challenges, Chapter 8, for issues regarding implementing Areas of Special Concern.

MDE is developing a program to label certain areas (particularly, but not exclusively, areas near shellfish waters) as "Areas of Special Concern." MDE will need to provide guidance to and work with local jurisdictions for identifying and designating Areas of Special Concern through the water and sewer planning process, and provide a time line to ensure that these are designated in a timely manner. MDE will also need to identify how it will assure that these important areas are protected consistently throughout the state. MDE guidance should include narrative guidelines and specific numeric criteria for local jurisdictions to use in designating these areas. The narrative guidelines would require the protection of specific, previously identified categories for protection while the numeric criteria (e.g. groundwater with measured concentrations greater than 10 mg/l nitrate -- the maximum contaminant level for drinking water in Maryland)[8] would provide "triggers" for local jurisdictions to use during the designation process.

Management districts, or maintenance agreements, should be required in all Areas of Special Concern, community and shared systems; and for newly installed or shared systems which utilize non-traditional technologies. A framework with recommended options is included in Chapter 3 Management Districts.

In addition, resolving the environmental and public health threats from communities with widespread septic system failure needs immediate attention. The Task Force recommends having replacement non-traditional (nutrient reducing) systems in place for communities in Areas of Special Concern by 2010, or ten years after they are listed as Areas of Special Concern.

Recommendation:

1. *Ten types of areas within the State need immediate protection from pollutant impacts from on-site systems. MDE should work with local governments and other agencies to establish guidelines for identifying additional Areas of Special Concern.*

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[8] US Environmental Protection Agency, Drinking Water Regulations and Health Advisories. US EPA, Office of Water, 11 p., 1995, Washington, D.C. And, Code of Maryland Regulations 26.04.01.06.

Narrative guidelines should include protection of the following ten Areas of Special Concern:

- *Areas where high water tables or marginal soils (which may pass percolation tests initially) are likely to produce hydraulic or treatment failures from conventional systems.*

- *Any area where septic failure has created a public health or environmental threat*. This would include both hydraulic failures and pollutant treatment failures of existing conventional systems.

- *Any area where OSDS have been identified as significant contributors of nutrients or other pollutants to groundwater or to nearby receiving streams.*

- *Areas adjacent to water supply reservoirs*. State and local regulations recognize the need for enhanced protection from conventional OSDS in areas draining to water supply reservoirs. The State of Maryland currently has more stringent requirements for septic system distance from receiving streams in reservoir watersheds (200 ft) than in other areas (100 ft). The State also requires a minimum lot size of 2 acres and lot width of 175 feet if the lot is less than 2,500 feet from normal high water near water supply reservoirs.

- *Wellhead protection areas*. These are the surface and subsurface areas around public water supply wells or springs though which pollutants could move toward the water supply. The majority of Maryland's wellhead protection areas still need to be delineated. According to Maryland's Source Water Assessment Plan, published in February 1999, well head areas and their potential pollutants and risks, will be identified by 2003.

- *Areas with a high concentration of domestic wells.* Enhanced protection is needed particularly in some older communities, like Boyds in Montgomery County, where the lots are much smaller than one acre and are served by both private well and on-site disposal systems. In most cases, the enhancement of on-site disposal will occur as part of an expansion on that site (e.g., an addition with more bedrooms) or replacement of a failing septic system. MDE will need to provide criteria for identifying areas with "high" concentrations of wells.

- *Areas with a high concentration of conventional on-site disposal systems*. This category would cover areas where public water has become available but where individual on-site systems are still being used, perhaps on lots smaller than one acre. Although the best known examples occur within the Chesapeake Bay Critical Area, it is possible that there are older communities in other parts of the State which will fall into this category for protection. Given the widespread lack of maintenance of conventional systems, it may be likely that these areas represent a concentration of failing or inadequate systems that need to be addressed. MDE will need to provide criteria for identifying these areas.

- *Areas with underlying karst geology*. Karst areas are formed by dissolving carbonate rock

and are associated with sinkholes, caves, disappearing streams and springs. These areas are particularly sensitive to environmental degradation, especially groundwater depletion and contamination. Karst areas, and problems associated with karst areas, have been identified in Allegany, Carroll, Frederick, and Washington Counties.

- *Chesapeake Bay Critical Areas.* These include the areas defined in the Maryland's Critical Areas regulations, being within 1,000 feet of tidal tributaries or head of tide. A variety of studies have documented elevated nitrate levels in the shallow, unconfined aquifers in the Coastal Plain region of the Chesapeake Bay, which includes Maryland's Critical Areas. Typically, overlying soils in these areas provide little treatment of pollutants that seep into subsurface flow which then discharges to the receiving water body. Given the proven sensitivity of tidal areas to nutrient pollution, reducing nitrate levels in the contributing areas would provide a direct benefit to the receiving water bodies.

- *Areas adjacent to the Coastal Bays.* These are the areas that drain to the shallow bays behind Ocean City and Assateague Island including Assawoman, Isle of Wight, Sinepuxent, Newport and Chincoteague Bays. Nutrient pollution has been identified as the greatest environmental problem affecting these water bodies. Subsurface flow characteristics to these water bodies is similar to that in the Critical Areas, so that reducing nitrogen to groundwater from all sources in the drainage areas is necessary to the long term protection of these water bodies.

CHAPTER 3
MANAGEMENT DISTRICTS: A FRAMEWORK FOR MANAGEMENT

The Task Force identified a need for management districts to ensure that maintenance and operation responsibilities are met. When properly sited, designed, installed, operated, monitored, and maintained, on-site sewage systems provide wastewater treatment for a long period of time. However, when any activity or stage is mishandled, it generally jeopardizes the integrity, performance, and value of the system and results in personal and public risks.

State and local regulatory personnel administer minimum standards and provide general oversight, while the private sector also has a significant role. But when all the work of these professionals is completed, responsibility for using and maintaining the system usually falls to the system owner. Although brochures and videos have been made available, this hands-off approach has been unsuccessful. The need to ensure maintenance in preventing non-traditional OSDS failure is a particular concern. Management districts and management agreements can alleviate this concern by managing the proper operation and maintenance of these systems.

Current Conditions

Until recently, community-based management of OSDS has not been pursued at the local level. There are many reasons, but perhaps the most common may be the relative ease of permitting OSDS with little or no need for administrative follow-up, the lack of incentives or resources to take on this responsibility, and the readily available sources of funding for building and extending waste water treatment facilities.

As more is learned about the nutrient contributions of OSDS to the environment, there is increasing recognition that more must be done to manage this source of pollution, especially in the face of increased growth pressures and nutrient management caps. Traditional systems do not provide the level of nutrient attenuation that non-traditional systems do, but non-traditional systems are more maintenance-intensive.

Recommendations:

The Task Force considered a range of options, from centralized State management to doing nothing. Key issues discussed by the group included:

- Achieving continued, effective maintenance without undue bureaucracy
- Financing the establishment and administration of a management district
- Whether the establishment of a district should be mandatory or voluntary

The Task Force recommends more comprehensive management of OSDS through the use of "management districts," areas where inspections, maintenance and education can be *coordinated* to serve groups of OSDS. Maryland should require the establishment of management districts or management agreements for Areas of Special Concern, community and shared systems, and for newly installed or repaired systems which utilize non-traditional technologies, including nutrient reduction technologies. Management districts would be voluntary at the community level for all other areas (see below).

Because Areas of Special Concern, community and shared systems, and systems which utilize non-traditional technologies present challenges for maintenance, monitoring and education, these types of systems should be maintained in the future by a "management entity" (formal organization that performs several tasks), with oversight by the local health department. Owners of these systems will be required to establish a contract (management agreement) with a management entity. Systems in close proximity to each other could establish a management district. Some of the options for a management entity include:

Direct Management
· City
· County
· Intergovernmental contract
· Joint management agency
· County service district
· County water and sewer district

Specially Created Governmental Units
· Sanitary district
· Water and sewer authority
· Metropolitan water district
· Metropolitan sewer district
· Watershed district
· Service districts

Private Parties
· For profit
· Not-for-profit

Individual management agreements and management districts must present a plan or schedule for performing the following:

· monitoring and collecting data
· reporting to authorities on the condition of the systems
· inspections
· maintenance and repairs
· pumping, treating and disposing of septage
· issuing and enforcing notices to owners of failed systems or referring to proper enforcement authority

Management agreements with system users would be fee-based and would cover the costs of operations. Management districts would charge fees and assess fines, and could receive funding from the State Revolving Fund (SRF) and other programs, and from appropriations from the General Assembly. Low-income, elderly and other system owners in need could receive support for all or part of the costs of repair and replacement of failing systems.

Remedies for failure to pay fees or repair systems might include fines and penalties, a priority lien on the property, shutting off other utilities (electric, water), civil action in small claims court, or other ideas.

For those areas and communities not designated as "Areas of Special Concern," which have conventional (existing or new) OSDS, a program would be developed to offer financing incentives to form management districts. Because the repair and replacement of failing OSDS is only part of the management process, and education and knowledge about proper system use and maintenance is vital, repair and replacement should be coupled with education and together be supported with financial incentives.

Creating a Management District

A community, portion of a community, or even several communities within a watershed, could choose to form a management district and agree to develop an On-site Sewage Disposal System (OSDS) management plan (along the lines of a "nutrient management plan"). In return, the district would receive a planning grant and an SRF capitalization loan to start a community revolving loan fund, which makes available low-interest, long-term loans for the repair and replacement of failed systems. Only OSDS within a district's "plan area" could qualify for the reduced-rate loans, and perhaps other incentives such as tax credits for implementation of nutrient removal technologies. Support for the management district would come from fees and fines (and from interest earned on a revolving fund, see below). The plan would identify a range of services which would be provided to owners, which might include any combination of the following. The Task Force recommends that those services marked with asterisks would be mandatory.

· Design (including nutrient reduction technologies)
· Inspection*
· Reporting services*
· Issuing and enforcing notices of failure or referring to proper enforcement authority*
· Maintenance*
· Identification of "priority areas" which would be eligible for priority funding
· Monitoring* and tracking of cumulative effects of all OSDS in an area

Operational Permits

As part of this process, the local health departments would be responsible for issuing operational permits for OSDS that are installed, repaired or modified, as well as when properties served by OSDS are refinanced or expanded, sold or seek a change in use. Priority will be given to all systems in Areas of Special Concern.

The permit would describe the owners' responsibilities and provide specific instructions and schedules for:

· operating and maintaining the system
· recording maintenance and monitoring activities
· reporting inspection and maintenance activities to the local health department on a regular

basis

These responsibilities could be assumed in the management agreement or by the management district, but this process provides a feedback loop to local health departments for ongoing monitoring and performance data. As has been done in other states, the Maryland State Revolving Funds (SRF) Loans could be provided to local governments for the establishment of local revolving funds for the repair and replacement of failed systems. The interest charged on these loans, perhaps 2%-5%, could be retained by the local government for the administration of the program, while the interest on the SRF loan to the local government could be paid by a one-time appropriation from the General Assembly.

CHAPTER 4
EDUCATION

The need for education cannot be overemphasized. The high failure rate of conventional septic systems, the lack of a forceful movement for the adoption of nontraditional systems, and the growing concerns about the impacts of suburban sprawl — usually associated with septic systems — all testify to the great need to educate system users, local governments, engineers, builders, bankers, Realtors and others about the options for reducing the impacts of septic systems. Just as there are many decision makers involved in a home's location, design and maintenance, so there are many audiences who need information about options for treating and disposing wastewater. These range from the local governments who approve local land use decisions, the architects, engineers and builders who design and site homes, the bankers who finance them, and the homeowners who are ultimately responsible for maintenance.

Public awareness and understanding of OSDS regulations will be critical to their acceptance, implementation and efficacy. A focused effort to provide information on existing and proposed regulations is needed.

Concern 1: Many system users are not aware of the maintenance requirements of conventional septic systems, and have systems that are failing and creating a threat to water quality.

Findings:
Although conventional septic systems contribute to water quality degradation, individual system users lack awareness of their role in preventing the problem. Moreover, most homes with on-site wastewater treatment systems also have private wells for drinking water. It is imperative that both systems are properly managed and maintained, especially when they are in close proximity. Improper operation and maintenance are major causes of system failure. Realtors, bankers and builders also lack awareness and information on these systems, and the word-of-mouth information they pass along is often incorrect.

Current education and outreach efforts do not adequately persuade individuals to maintain their septic systems. Many local governments have education and outreach materials (brochures and pamphlets), but this hands off approach has been unsuccessful in ensuring appropriate management of OSDS. A survey of local health departments indicates that delivery of educational materials on septic systems is inconsistent across the State and usually only occurs when a permit is issued to construct a system or *after* the system user has experienced a failure problem.

A regulatory approach by itself will not be sufficient to ensure the outcome of reduced impacts from septic systems, and must be coupled with a comprehensive education and outreach initiative. For example, an expansion of the Maryland Cooperative Extension's private septic system program and other training courses now in place would begin to address the education

needs. Education can highlight the value of regular pump outs to the longevity

of septic systems, and the added benefits to the homeowner of augmenting their disposal system with nutrient reduction technology.

To further aid the education effort, a web site administered by MDE would be a valuable resource for the public and local governments. This could provide information on how to design, locate, and maintain conventional OSDS as well as non-traditional systems. It should have links to vendors of approved non-traditional systems so that property owners can evaluate which system may be best for their particular site.

Recommendations:

1. *Expand existing educational efforts to increase understanding among property owners, bankers, Realtors, and other key audiences of the cumulative impact of system failures on watershed functions, and the need for responsible actions by property owners.*

2. *MDE should expand its OSDS web site with information on non-traditional systems, educational materials, training, class listings, a list of certified persons (haulers, contractors and inspectors) and links to other resources.*

Concern 2: Owners of non-traditional treatment systems need to understand and be responsible for properly maintaining their system.

Findings:
Newer innovative systems are now available that reduce nitrogen and phosphorus in effluent. These systems are more complex than conventional systems, and typically require more monitoring and maintenance. Without effective education and a county/state mandatory monitoring program in place, non-traditional systems will probably not be appropriately maintained and will not function properly. Demonstration sites which include a variety of non-traditional technologies would provide owners with a first-hand opportunity to view the advantages and requirements of these systems.

Recommendation (see also recommendations under Concern 1)**:**

3. *At least three demonstration areas should be created as a tool for education, outreach and promotion of new OSDS technologies, and their impacts on groundwater. These should be located on the Eastern Shore, in the Western Shore Coastal Plain, and in the Piedmont, so that the systems can demonstrate how they function under different geologic and hydrologic conditions.*

Concern 3: Often, local health departments do not permit or promote non-traditional systems that greatly reduce nutrient loads from septic systems. There is a need to educate this audience about the benefits of non-traditional systems, and provide incentives for property owners to install these systems.

Concern 4: There is a need to work with homeowner associations, builders, developers, engineers and architects to educate them about non-traditional systems, appropriate siting of systems, shared systems, and other options to reduce septic system impacts.

Findings:
Many local county health departments are wary of changing their codes and allowing non-traditional treatment/disposal systems. There is a justified concern about whether the required maintenance will be done by the owner once these systems are put in place. A district or governing authority is needed if these systems are to be widely accepted. Of course, additional manpower, record keeping and inspection needs must be addressed before local county health departments can facilitate the installation of these systems. MDE could provide information on non-traditional systems to local health departments, and could actively promote their adoption by providing technical assistance, information sharing among counties, and periodic meetings and workshops. Incentives to promote their adoption could also be explored and shared with local governments. MDE could work jointly through existing networks, professional organizations and associations to provide information to these audiences, and to identify barriers to the increased adoption of non-traditional OSDS solutions.

Non-traditional septic treatment systems will not find widespread acceptance and use without the promotion of these systems outside of MDE and local health department officials. Builders, developers, engineers, architects, and property owners, need to be made aware of the choices available today. They must also be made aware that these systems should not be used in sensitive areas or areas outside of designated growth areas. MDE could work jointly through existing networks, professional organizations and associations to provide information to these audiences, and to identify barriers to the increased adoption of non-traditional OSDS solutions.

Recommendation (see also Recommendations under Concern 2):

4. *Expand assistance to local governments and others on non-traditional systems, including: overall technical assistance, and working with service providers such as Maryland Environmental Service, builders and haulers. A major focus should be increasing awareness of non-traditional technologies that provide additional environmental benefits.*

An Owners Manual

The following are examples for homeowner education from the NSF Publication ANSI/NSF 40 - 1996, *Residential Waste water Treatment Systems;* sec 6.1, Owner's Manual).

The Owners Manual shall be written so as to be easily understood by the intended reader and shall include, as a minimum:

- a functional description of system operation, preferably including diagrams illustrating basic system design and flow-path;
- clear statement of examples of the types of waste that can be effectively treated by the system;
- a list of household substances that, if discharged to the system, may adversely affect the system, the process, or the environment; requirement for the periodic removal of residuals from the system;
- comprehensive operating instructions that clearly delineate proper function of the system, operating and maintenance responsibilities of the owner and authorized service personnel, and service-related obligations of the manufacturer.

Concern 5: There is a lack of proper training and certification for inspectors. There is a need for uniformity to provide property owners with consistent, reliable service.

Findings:
The current plan for MDE to provide training courses, as required in Title 26, 9-217.1 (enacted during the 1998 legislative session) is an excellent start to solving this problem. The training courses will certainly help, but they don't go far enough.

The current law says that an inspector must attend the course. It is silent on whether an inspector must demonstrate comprehension of the information. No exam is required. This is not acceptable and responsible inspectors have already indicated that they would support a requirement that they pass a test as a condition of completing the training course. Nor does the law require the MDE training course to identify the minimum elements of a comprehensive inspection. Property owners will be faced with a variety of potential inspection levels, none of which will prove that they have a properly functioning system.

While civil lawsuits may be a way to curtail shoddy inspections, they are ineffective to ensuring proper system function or to identifying maintenance and repair that might prevent failure of a marginally functioning system.

Recommendation:

5. *MDE should require OSDS inspectors to be certified. Recent legislation requires inspectors to attend an MDE approved training course; this requirement should be expanded to require inspectors to pass an examination to demonstrate their knowledge of approved practices and procedures, and to complete continuing education requirements every three years. This procedure could be fee-based, and therefore self-supportive.*

Concern 6: There is a need for uniform training and licensing of septic haulers throughout the state to ensure proper pumping of septic systems, proper handling of the waste, and to assist in the record keeping database management that is needed.

Concern 7: There is a need for the training and licensing of installers of OSDS to ensure proper technique.

Findings:
There is typically no licensing or training requirement for OSDS installers and haulers. Some counties (Garrett) require training of installers, but the majority do not. In most cases, anyone can purchase a sewage tank truck, and start pumping septic systems without any formal training on the system, or without understanding the specific requirements of these systems or the importance of proper installation. Many times systems are installed incorrectly, and never function properly from the beginning.

In addition to this, no formal statewide record keeping is required of system placement, repairs or maintenance. There is no statewide requirement for specific marking of the whereabouts of these systems (no risers to the surface to allow for easy access, inspection and pumping) so that the homeowner is made aware that the system exists in their yard. If specific log sheets were filled out each time a system is installed, inspected or pumped, local health departments and the property owners could stay abreast of any problems, and good records could be kept throughout the state on the number, location, and success/failures of these systems.

Recommendations:

6. *MDE should require septage haulers to be licensed and trained. Haulers should be required to report the amounts pumped out and delivered to wastewater treatment plants to local governments, and to the property owner. Training would involve proper inspection procedures, pumping technique, and how to fill in the reporting form. This procedure could be fee-based, and therefore self-supportive.*

7. *MDE should require OSDS installers to be certified. The inspection certification should indicate the types of system that the company plans to install or inspect. This procedure could be fee-based, and therefore self-supportive.*

Concern 8: While Banks have a vested interest in protecting their investment by

preventing septic system failure, current inspection requirements are inadequate.

Concern 9: Realtors could be, but are not currently, a valuable resource for providing information to home buyers on septic system care and maintenance.

Findings:
Banks currently require septic inspection as part of the mortgage approval process, but this inspection is often not adequate because inspectors are currently not required to be certified. MDE is working to rectify this problem by providing training for inspectors. (The need for certification for inspectors is discussed above.) It would be helpful if banks requested inspections that involved specific steps, currently under development by MDE.

Mortgage lenders and Realtors are not any more educated about septic systems than the home purchasers themselves. Yet they deal with properties having septic systems on a daily basis. These two groups are often the front line in bringing up the subject of septic systems to the property owners for the first time. The Maryland Cooperative Extension's septic educational program, and any other training courses now in place to educate property owners on managing their septic systems, could be used to also instruct mortgage lenders and Realtor Associations throughout the state.

In Maryland, an individual can purchase a home without ever being notified that it has an OSDS, much less receive any information on operation and maintenance. A property owner *might* be informed of the system at the settlement table, or get information from previous owners, but there are no guarantees that this will happen. Information is not given out at the time of home purchase and settlement, so new property owners are typically unaware of the septic system until *obvious* failure occurs. Worse, the majority of septic failures are *not* obvious, and therefore go undetected for years, polluting ground and surface water resources, and threatening human health. Specific notification and information on the system needs to be included in the sales contract, so that the potential purchaser can consider the implications of having an OSDS.

Typically, expansion must be reported to local health departments when a bedroom is added. Some homeowners evade this requirement by adding rooms that are not called bedrooms, but are used as such, and add to the home's wastewater load. The could be addressed by defining expansion in terms of square footage rather than bedrooms.

Recommendations:

8. MDE should require a formal disclosure process and education program to accompany any transfer of property with an OSDS. This disclosure should be made prior to the actual settlement date, and should be included in the sales contract of the property.

9. I*nspections of conventional OSDS should be required at the time of real estate transfer, expansion, change of use, or as a renewal of an operational permit. See further discussion of inspections in Chapter 5, Conventional Systems.*

Concern 10: There is a need to educate all stakeholder groups about the requirements in existing and proposed regulations and the reasons for these requirements.

CHAPTER 5
CONVENTIONAL OSDS

Over 400,000 Maryland residences and businesses are served by on-site sewage disposal systems -- most of them still using technologies that were introduced over 50 years ago.

In Maryland, a conventional OSDS typically consists of a container (tank), with an inlet, an outlet, a pumping port and several internal baffles. The outlet drains partially clarified liquids to a "drain field," a network of pipes which distributes the wastewater to a soil, sand, or gravel media for absorption, distribution and removal. The septic tank removes solids by holding the wastewater in the tank, allowing solids time to settle to the bottom and scum (greases, fats and other lightweight materials) to float to the top. The septic tank provides for primary settling and partial digestion of organic matter. Baffles help to prevent wastewater from moving through the tank too quickly and forces wastewater to enter and exit below the scum layer. The goal of the drain field, with soil, sand, or gravel absorption areas (used in both conventional and non-conventional systems) may be the hydraulic disposal of the effluent to the ground (i.e. groundwater) and/ or the maximum treatment and attenuation of the effluent by the soil (through a processes of physical filtration, biologic competition, ion exchange, and adsorption) before it reaches the groundwater.

MDE estimates that as much as 80 to 100 percent of the nitrogen in septic tank effluent may reach ground water. Many older systems were installed before the establishment of soil treatment zone requirements and may have little to no unsaturated soil for treatment beneath the trench. For most of the State, COMAR specifies a four-foot thick unsaturated soil treatment zone. COMAR permits counties in Maryland's coastal plain to designate areas where less than a four-foot unsaturated treatment zone may be allowed, provided existing or potential underground drinking water resources are not affected. This shallow groundwater typically discharges directly into the local waterway. When deep trench filtration fields are used there is virtually no nitrogen uptake, and the nitrogen goes straight into the groundwater.

Regulated by County Health Departments and the MDE's Water Management Administration, the interpretation of a conventional septic system failure was and is still centered on the hydraulic capacity of the system. Historically, as long as the sewage did not surface and/or back up into a residence or business, the presumption was that public health was being protected. Based on this premise, both MDE and several health departments promulgated regulations to improve the hydraulic capacity of OSDS. County health departments looked at deeper soils with their often-greater hydraulic capacity as assurance against hydraulic overloading, and MDE looked at improved soil evaluations and site criteria to help lengthen the life span of the disposal system. Technologies and techniques that were first developed for OSDS were primarily viewed, and still are to some extent, as a mechanism for improving the distribution of the wastewater in order to extend the capacity of the soils to accept wastewater.

In order to address the limitations of conventional systems, the Task Force focused on four areas:

C a mechanism to ensure OSDS operations and maintenance;

- C the need to address communities with failing OSDS;
- C issues relating to upgrading conventional systems with non-traditional (nutrient reduction) technology; and
- C the need to promote low cost retrofits.

Code of Maryland (COMAR)

The following background is from: Best Management Practices: Mitigating Impacts of On-Site Sewage Disposal Systems" Maryland Department of the Environment, unpublished paper, 1998.

"Code of Maryland Regulation (COMAR) recognizes two categories of OSDS: Conventional and non-conventional. Conventional OSDS are those systems in use for which current regulations provide siting and design criteria. They can be used to replace or upgrade existing systems, as the basis of approval for existing lots of record, or as the basis of approval for the subdivision of land. Non-Conventional OSDS are those systems for which siting and design criteria are being developed and evaluated. The use of Non-Conventional technologies are restricted to existing lots of record and cannot be used as the basis for subdivision of land.

Non-Conventional systems fall into two categories: innovative and alternative (Non-Conventional does not mean nutrient reducing). Innovative systems are the most experimental systems considered by the State and their use is restricted to developed sites that have no in-door plumbing or are served by a failing sewage disposal system. Alternative systems, while still non-conventional, are transitional toward becoming conventional. Alternative systems may be used on existing lots of record to serve new construction. Under current regulations, neither innovative nor alternative systems may be used as the basis of approval for new subdivision of land or the creation of new lots.

Concern 1: A mechanism is needed to ensure that owners maintain OSDS.

Findings:
Residences and businesses generally service their OSDS when it becomes problematic and when a health hazard is either imminent or already occurring. Currently, the only mechanism for monitoring and managing septic systems is a response by local health departments to a citizen's complaints regarding a failed system. Typically a resident will call the local health department and complain about a neighbor, usually because of odors, regarding a failing system. The health department responds by visiting the site and advising the home owner to correct the problem. If the system needs to be pumped out, then this is usually done, bu most of the time the drain field has failed and they don't want (or can't afford) the expense of installing a new drain field. These failed systems can sometimes be "failed" for many years. Although it is widely known that many systems have or "are" failing, there is no real

mechanism in place with local authorities to force home owners to replace or repair their system. Local health departments need a definitive means to identify failed systems, document them, and enact enforcement or other actions that require correction. This becomes even more of an issue when entire communities have failed systems.

Some areas around the nation now require regular inspection and pump out of septic tanks on a periodic basis. Mandatory inspections are required in several states, i.e. North Carolina, Washington, Connecticut, Florida, and Massachusetts. These inspections prolong the life of the system by preventing solids filling the tank and then migrating into and clogging the drain field. A clogged drain field can force effluent to the surface, creating a public health hazard. This failure can also deliver nitrogen directly to surface waters.

A thorough OSDS inspection should include a pump out. Without a pump out at the time of inspection, inspectors are not able to determine if the baffles are in place and functioning, if the system is functioning properly, if the drain field has failed, or if the sludge level and crust level are at volumes too large to allow the required water retention period. The need for regular pump outs can vary widely depending on the number of people in a house, whether or not they use a garbage disposal, and what foreign materials are disposed of in the system. Penn State has developed some guidelines that suggest pump out frequencies.

Recommendations:

1. *MDE should require owners to obtain an operational permit for an OSDS.* Operational permits would provide information on OSDS that are installed, repaired or modified, as well as when properties served by septic systems are refinanced or expanded, sold, or seek a change in use. The Operational Permit would detail the system user's responsibility for the care and maintenance of the system. An expiration date would be affixed to the permit and renewal would require an inspection. Regulations are necessary to define penalties for non-compliance and for assessing fees to finance the monitoring of the program. Regulations should also assess the value of tax incentives to encourage compliance. Priority will be given to all systems in areas of special concern. The permit would describe the owner's responsibilities and provide specific instructions and schedules for:
   - **S** operating and maintaining the system
   - **S** recording maintenance and monitoring activities
   - **S** reporting inspection and maintenance activities to the local health department on a regular basis

2. I*nspections of conventional OSDS should be required at the time of real estate transfer, expansion, change of use, or as a renewal of an operational permit.* Only certified and license inspectors would be authorized to inspect OSDS. Inspection reports would be forwarded to the realtor as an attachment to the final sales contract (property transfer) or to the approving governmental agency responsible for approving changes in use or expansion of a residence or business.

3. *A complete inspection should include a pump out.* Inspections should include, at a minimum, checking the solids level in the tank to assure solids are not entering the s, ascertaining the functionality of mechanical components and checking the ground for any surface discharge.

Concern 2: There are many areas (communities) of the State where on-site sewage disposal systems are either failing or working only marginally. These failures often can not be abated by extending public sewer.

Findings:
Disease and other health impairments are linked with malfunctioning sewage disposal systems. Many of these malfunctioning sewage disposal systems are associated with existing older communities. Older neighborhoods often have undersized, obsolete systems that cannot be readily repaired due to the lack of adequate area for the installation of replacement systems. Many of these older communities, often in rural areas, contain tiny lots and narrow roads making it physically difficult and expensive to effect replacements and upgrades. For reasons of public health, the preservation of the quality of life in rural villages, pollution prevention and environmental justice, the State should make a concerted effort to address these existing problems. County water and sewer plans should identify these areas and strategies to address the problem. Target dates for resolution of these problems should be set with a priority on those in Areas of Special Concern.

Recommendations:

4. *A management district should be required in communities where many systems need to be replaced. Costs of these systems for low-income residents could be addressed through a combination of grants, low-interest long-term loans, and subsidized maintenance fees.*

5. *Replacement systems for communities with widespread septic system failures should be with non-traditional (nutrient reduction) systems.*

6. *Resolving the environmental and public health threats from these OSDS in communities with widespread system failure needs immediate attention. The Task Force recommends having replacement non-traditional systems in place for these communities (which are recommended as Areas of Special Concern) by 2010, or ten years after they are listed.*

7. *Establish a policy level task force of state and local representatives to identify these communities.* This group will organize technical, community development and financial assistance to these communities. Maryland Rural Development Corporation (and other community action agencies), Department of Housing and Community Development, Federal Rural Development, and MDE are involved in this issue, but a concerted effort to coordinate the delivery of their programs is needed.

8. *Establish a Technical Team of federal, state, local and private experts to analyze the best onsite and small community systems that could work for these communities*. Maryland could be a statewide pilot for a federal partnership to address these issues.

9. *Develop new funding approaches for both capital and operations and maintenance expenses*. For example, some states are setting aside a small percentage of repayments to their SRF to be used to subsidize maintenance in the poorest communities.

Concern 3. Installing nutrient reduction technology into existing conventional OSDS is perceived as being expensive and inconvenient to the property owner and results in higher maintenance costs.

Findings:
Providing a cost-effective mechanism to monitor and maintain a nutrient reduction system is critical to the system's performance and to assure public health and decreasing nutrient loads. Major issues are:

Educating the public and gaining their acceptance to incur the additional cost of sewage disposal alternatives to better protect public health or Maryland's Bays may be difficult. The cost and inconvenience to homeowners to install a nutrient reduction system retrofit in the absence of a hydraulic failure problem with their current system greatly reduces the likelihood that voluntary changes will be made solely to reduce nutrients and improve the environment.

Data for Maryland - While conventional septic system technology is not designed to reduce nitrogen, data linking well-functioning conventional septic systems to public health problems or to environmental degradation is regional and not definitive. Significant research has not been accomplished to quantitatively link nutrient releases from all on-site sewage disposal systems to the pollution of Maryland's Bays. Research by Otis in Florida and Wisconsin, Cherry and Robertson in Ontario[9], and others in North Carolina and Washington State, supports the premise that nitrogen contamination of groundwater does occur, and will travel unimpeded unless denitrification occurs. As such, while there is a strong correlation between nitrogen contamination of groundwater and effluent from sewage disposal systems, there is only circumstantial evidence that supports nitrogen contamination of surface water from functioning on-site sewage disposal systems located over one mile from surface waters.

Cost - OSDS can be designed with technologies to reduce nitrogen in septic effluent by 23 to 100%[10]. However these systems, which generally rely on additional pumps, motors, tanks and

[9] J. A. Cherry and W. D. Robertson - Persistence of Nitrate in Three Septic System Plumes on Unconfined Sands in Ontario , Waterloo, Ontario

[10] Thomas Long – Methodology to Predict Nitrogen Loading from On-site Sewage Treatment Systems Seattle, Washington

filters to achieve the nitrogen reduction desired, can cost a home or business owner 30% or more than the average cost of an OSDS. The cost to retrofit an existing disposal system would be expected to be even higher.

Management - Due to the technical aspects of nitrogen reduction systems, scheduled monitoring and maintenance of these systems is needed. Lacking the knowledge, skills and desire to maintain these technically advanced systems, system users are not likely to maintain them. Without proper monitoring and maintenance, these systems will fail, often resulting in a health hazard. A re-circulating sand filter in Prince George's County failed after six years in use due to the lack of homeowner maintenance. The failed system resulted in a surface discharge at the sand filter causing a health hazard. Several contractors of nutrient reducing equipment offer service contracts to homeowners. These contracts provide the homeowners with periodic monitoring and maintenance of the nutrient reducing system for an annual fee of $300 or more.

Recommendations:

10. *Mandatory addition of nutrient reduction technology for existing OSDS should be required for replacements, upgrades or property transfers in Areas of Special Concern.*

11. *Financial assistance should be made available for the capital costs of adding nutrient reduction technology to existing properties with OSDS in Areas of Special Concern.*

Concern 4: While the Task Force recommends the widespread adoption of non-traditional systems, until this occurs, there is a need to increase awareness of existing low-cost improvements to currently designed systems. These improvements do not significantly remove nutrients but lengthen the life of the system.

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Finding:

Low-cost improvements (e.g., septic tank outlet filters) are available for use and can be implemented today. While these do not remove nutrients, they do lengthen the life of conventional systems. By helping to prevent system failure, they perform an important public health service that should be encouraged.

The Task Force supports the passage of the draft regulations (COMAR 26.04.02 and .03). These regulations begin to address deficiencies in the current septic system design. The new loading calculation, two compartment tanks and their water tight requirement should provide a significant step in lengthening the life of a disposal system and offers a serious step in the reduction of the number of malfunctioning systems and, thus, a further protection of public health.

Recommendations:

12. *MDE should identify regulatory opportunities for low-cost improvements to existing conventional systems while the State is in transition toward implementing more non-*

traditional, nitrogen removing systems.

The Task Force further recommends that MDE:

- Augment these regulations by requiring septic tanks be certified to meet certain specifications and to be watertight. This will assist in assuring that septic tanks are not hydraulically overloaded and cause premature failure of the septic system.

- Require that septic tanks be redesigned to accommodate an aerobic unit capable of meeting specific discharge requirement systems.

- Propose that septic system design parameters allow for easy augmentation of secondary treatment, which will significantly reduce bacteriological and chemical parameters that affect public health.

- Propose that septic systems be designed to allow for the installation of a diversion valve or some other mechanism that would allow a portion of the drainfield to rest. Resting systems provide relief of a potentially failing system and can substantially extend the life of a system resulting in significant cost savings to the property owner.

Case Study: Northern Caroline County - A Need for More Options

The four small towns of Goldsboro, Henderson, Marydel and Templeville are separated from each other by two to three miles but have much in common when it comes to failing OSDS, polluted wells and wet soils. These unsanitary conditions frustrate even the modest community development and economic activity appropriate to a rural village.

Over the years, studies to solve the wastewater problems of one town or another were done, but the projects were too expensive to build or maintain. It is especially important to have a system with economical long-term operation and maintenance (O&M) costs as this is a low-income area. Grants and loans may be available to help build a system, but there is no funding to support O&M costs.

A conventional regional system using gravity sewers and an activated sludge lagoon has been proposed and would work. The County Commissioners have pledged to help organize the effort, providing the basis for an extraordinary level of cooperation among the towns and county. However, the capital outlay to construct the system is enormous, over $18,000 per dwelling unit.

Could non-traditional technologies work and be less expensive? In the absence of an organized effort to analyze such practices, assess with confidence their capital and long-range O&M costs and apply this knowledge systematically to small communities, we simply don't know.

The towns of northern Caroline County are not alone. Their problems are shared by many small communities in Maryland. These funding challenges and technology issues demand our best and most creative efforts.

CHAPTER 6
NON-TRADITIONAL OSDS

The Task Force seeks to encourage the use of innovative on-site sewage disposal systems (OSDS) technologies that will reduce nutrient loadings to the watersheds because, while functioning as designed, conventional septic systems do not provide people or ecosystems sufficient safety from pollutants. Conventional septic systems in use today are having significant impacts in some watersheds and have the potential to create future impacts in watersheds which today seem healthy. Thus, many health officials, state agencies, and users are looking to promising innovative technologies as a solution to the septic system nutrient pollution problem.

Concern does exists that widespread promotion of non-traditional systems may facilitate inappropriate development outside designated growth areas or in sensitive areas. Therefore, this discussion must include the caveat that non-traditional systems are not appropriate everywhere and the Task Force's recommendations of widespread acceptance and use must not be misinterpreted. To accomplish this, we recommend a process to verify that the technologies perform as claimed, suggest where and how these technologies should be applied, and discuss barriers to their implementation.

While there are many types of non-traditional systems, the Task Force defined non-traditional OSDS as systems that provide substantial nutrient reduction over conventional systems including, but not limited to: constructed wetlands, composting toilets, "living machines", elevated sand mounds, intermittent sand filters, recirculating sand filters, gravel filters, recirculating gravel filters, aerobic treatment systems, and peat bio-filters. These systems have been designed to treat and or remove some or all of the BOD, TSS, TKN, TN, TP, and fecal coliform to a greater degree than conventional systems. Some of these systems are described in Appendix B.

Task Force approach to non-traditional OSDS

A review of the alternative, or non-traditional systems, that are available for use today reveals a great degree of variation in their design and application. Some of these new technologies are not new at all, as they replicate natural systems, such as marshes or composting systems. In general these systems have a better record of removing nutrients, and other pollutants of concern, than conventional septic systems. This report also identifies shared characteristics which seem to determine their lack of acceptance by both users, regulators and local health departments - all of whom feel the responsibility of ensuring a safely functioning system. Local Health Departments are concerned about permitting systems with which they are unfamiliar. The Task Force feels strongly that non-traditional systems should be embraced This requires some serious revisions to our present policies.

In this report, the Task Force did not review the non-traditional systems in order to validate which ones were most effective, rather the Task Force concerned itself with recommendations which would ensure that a given system would be reviewed for approval, tracked, managed,

monitored, maintained and implemented sensitive to the concerns of cumulative impacts that development brings. The last part of this section focuses on the policy shifts and mechanisms for implementing such a shift in our thinking.

Concern 1. Many non-traditional systems have not been widely adopted or promoted due to concerns about Maryland's state codes and regulations.

Findings:
For non-traditional systems, as with all new technologies, the unfamiliarity with operation, reliability, risk, and cost has limited their application. In some cases, the lack of experience with some non-traditional systems has inhibited permitting at state or local levels, slowed adoption by planners, and generally prevented acceptance by public officials, developers, engineers, and / or, the general public.

Many approaches are available to decision-makers and state regulators regarding how to establish an environment that encourages innovations. Some states, such as Indiana, have been successfully encouraging the use of non-traditional technologies. They have many constructed wetlands for waste treatment, and have developed standard constructed wetland blueprints, incorporating them into their permitting process. Maryland could do that. Additionally, Maryland could follow the example of the MDE's well received, design manual for stormwater management. As new technologies become available, the design manual of approved technologies is updated, without requiring legislative or regulatory changes to the codes which establish the performance standards.

Recommendation:

1. *Clearly written, codes and regulations are needed for Maryland. MDE must continue to support the application of non-traditional systems. State and local governments must continue to cooperatively work together to develop OSDS policy.*

Concern 2. Many non-traditional systems have not been widely adopted or promoted due to concerns about costs.

Findings:
Costs for alternative systems, though variable, are sometimes higher than conventional systems due to their greater complexity and need for maintenance. Eventually, all Marylanders will need to accept the responsibilities and costs associated with pollution prevention. In Areas of Special Concern, the Task Force felt that the additional costs of non-traditional systems were justified by the need for additional environmental protection for these areas. Maintenance costs may also be reduced if these systems become more widespread and are serviced through maintenance agreements or management districts (see Chapter 3). The Task Force thought it was reasonable that the cost to an individual, for preventing OSDS nutrient pollution, should be at least equal to the costs incurred by an individual connected to sewer.

Recommendations:

2. *Financial assistance should be made available for the capital costs of adding nutrient reduction technology to existing properties with OSDS in Areas of Special Concern.*

3. *A management district should be required in communities where many systems need to be replaced. Costs of these systems for low-income residents could be addressed through a combination of grants, low-interest long-term loans, and subsidized maintenance fees.*

Concern 3. There is no independent approving entity to verify the design performance of a given system or it's continued efficacy.

Findings:
MDE and local regulators have commented that they have seen many "better systems" come and go over the years - frequently at no small expense to property owners and the environment. Local approving agencies have expressed concerns about permitting non-traditional systems that will not meet expected operation or desired pollutant removal standards after installation. A performance and verification process will promote better designs and perhaps help to generate less expensive alternative systems while assuring that these new designs meet standards that protect human and environmental health.

Recommendations:

4. MDE should adopt a verification process to ensure that a given new technology can perform as claimed, and should provide this information to all local governments. A recommended verification process for new technologies is explained in Appendix A.

5. MDE should adopt a monitoring process to ensure the ongoing performance of new, OSDS technologies and products, as detailed in Appendix B.

Concern 4. Non-traditional systems require maintenance, a mechanism to ensure their continued maintenance, and greater user/owner awareness.

Findings:
Once the systems design performance is satisfactorily verified the next important concern is maintaining the systems continued function and performance. Some entity must be assigned responsibility for this task. Property owners may be certified to maintain their own systems with appropriate training, bonding, or liability. The user/owner may thus take responsibility for routine maintenance and reporting, or they may hire an approved operator to conduct monitoring, and the required reporting, or the vendor of the system may provide a mechanism to assure long-term maintenance and performance monitoring of their installed systems.

Operational permits, management districts, and maintenance agreements can provide the needed structure to ensure the proper function of these systems. Management districts can provide the infrastructure necessary to manage the agreements, permits, and or maintenance. See Chapter 3. Management Districts: A Framework for Implementation.

The "permit to *operate* a non-traditional OSDS" should be contingent on the maintenance agreement (third party or owner/user). MDE should require both owner and contractor to notify their local Health Departments if the contractor is changed, the contract lapses, or maintenance is not being performed. Penalties (tickets) should be imposed if a new contract is not in effect within a determined period of time. This approach puts the responsibility on owners and contractors and establishes a feedback loop to local health departments. This will ensure that the systems will be operated as designed.

A critical aspect of institutionalizing non-traditional OSDS is education. The performance of a system depends, in large part, on the user, how they use it, and their ability to recognize the need for system maintenance. Chapter 4, Education, goes into considerable detail regarding the critical need for sustained public education.

Recommendation:

6. *Maintenance agreements should be required for all non-traditional systems. Property owners may be certified to maintain their own systems with appropriate training, bonding and liability.*

Concern 5. Though currently proposed in the MDE regulations, there is presently no coordinated Statewide tracking system of OSDS.

Finding:
Due to lack of data, it is difficult to assess the impact of all types of OSDS. At present there is no comprehensive method to calculate, statewide, the number of OSDS, and which ones are functioning as designed, maintained as needed, or replaced when necessary. Comprehensive monitoring in any area, much less Areas of Special Concern, is all but nonexistent. Tracking would help determine the magnitude of OSDS impacts, as well as helping target education, maintenance and monitoring efforts.

Recommendation:

7. *MDE, in cooperation with local governments and management entities should develop and institutionalize a tracking database to better assure proper maintenance and operation of OSDS.* This system would be maintained at the county level in a format standardized statewide, and would be designed to collect information such as the number and distribution of OSDS within a jurisdiction or defined maintenance area; watershed location; system type; problems and performance; sources of sewage; site and soil conditions; and housing or flow densities. This type of information could

ensure that maintenance requirements are met, to direct the establishment of a new sanitary district or to predict when new resources are needed.

Concern 6. Non-traditional systems could allow or encourage growth in areas where it is not appropriate.

Findings:

Although the Task Force wants regulations that encourage non-traditional systems with nutrient reduction capabilities, the Task Force does not support allowing their installation if the site is not suitable for a conventional system due to sensitive area concerns. Many local planners are concerned about the potential for non-traditional systems to promote sprawl by providing a technology that can work in soils unsuitable for conventional OSDS. These areas may be sensitive, outside planned growth areas or areas where growth should be limited. The advantages of nutrient reduction technologies should not open land for development (or greater densities) in those areas or in Areas of Special Concern. This would be contrary to the Task Force's goal of protecting sensitive areas and the State's Smart Growth and resource protection objectives. The intent is to promote non-traditional systems with nutrient reduction on infill lots that won't "perc" but that are already in developed areas, and as replacement systems where conventional systems have failed.

Non-traditional systems address the need to reduce nitrogen from OSDS effluent, but they must be accompanied by strong planning efforts to address the cumulative impacts of development. There is a need to establish strong policies that support the implementation of non-traditional technologies while preserving the landscape, viable agricultural land and sensitive areas. See Chapter 3 for "Areas of Special Concern".

Recommendation:

8. The implementation of non-traditional systems should not be allowed to make a lot buildable that is non-buildable under current regulations, except if it is in a designated growth area.

Case Study: La Grange County Health Department, Indiana

Quote from: Indiana Regulator, La Grange County Health Department

"We installed our first wetland in 1992 to repair a failing septic system where we had nothing big enough for conventional septic that didn't have heavy soils and high water, threw it together on our own, the owner put it in - old farmhouse, 3 children, 2 adults. We found a place about 15 x 20 for a wetland, followed it up with a little bed 20 x 20 filled with stone to take care of the water. It's still working. The technology is quite forgiving. Now we have standard blueprints depending on the size of home and waste-water flow. We worked it in with the septic rules so we could maintain the same type of permitting systems. Septic Systems don't work period. We had a lot of wells contaminated from septic systems and our lakes were affected, though it was difficult to test for that.

Now we have an 8,000 gal/day motel on a 65 x 100 wetland, lots of wetlands for new single family homes, a 600 unit campground, 200 home subdivision, a Holiday Inn. Cost for wetlands is equal or less than for septic systems. We've got a new system that has less than 5mm ammonia coming out winter and summer. We plant with 2-3 types of sedges, and at the end River Bullrush which has a tremendous evapotranspiration capacity, then people plant water iris, marsh marigold, cardinal flower, and by the time they're done they have a flower garden. People really get involved, really enthusiastic. We've been living with nature for a lot of years, enough to learn that we run into problems when we don't understand her, when we run bull-headed to do what we want to instead of playing by her rules."

CHAPTER 7
SHARED SYSTEMS

Community systems are those involving on-site sewage disposal systems in which responsibility for routine maintenance is distributed over more than one property owner. A community system may include a shared system or multiple independent systems. Shared systems, referred to as "shared facilities" in the State regulations, are systems where the infrastructure used for sewage treatment and disposal is shared by more than one property. For example, each home discharges sewage to a pipe network that carries the effluent to a disposal field used for all the homes in this series. At present, there are only a small number of shared systems in the State.

Depending on configuration, shared systems can provide better treatment, e.g., nutrient removal, at a more economical cost than individual on-site disposal systems. Within the State, there is a requirement for an independent management structure for the shared systems. This means that maintenance is completed routinely and repairs can be made in a more timely fashion resulting in fewer failed systems than for individual on-site disposal systems.

Shared systems can be used to great advantage to allow development where individual lots do not "perc" but which are in areas served by existing infrastructure other than central sewer. For example, a subdivision which has roads and is within *a designated growth area for a town* might not be able to develop every lot because poor soils limit the construction of individual on-site disposal systems. A shared system would use the most suitable soils for disposal on the remaining undeveloped lots rather than encourage individual systems on perhaps marginal soils. At the same time, the development could achieve full density, or even increased density, in the area already served by roads and planned for public safety and school capacity.

Concern 1: Shared systems, like other non-traditional systems, may allow development on lots that could not be developed with conventional systems.

Findings:
Promoting the use of shared systems outside of designated growth areas is likely to promote sprawl development unless there is accompanying zoning which strictly limits the total number of residential units in areas outside of a planned sewer area. Shared systems enable clustered development which can provide enhanced protection of resource lands. Clustering alone will not save resource land, as this requires preservation and a guarantee of no future development. Local land use planning needs to recognize the important geological characteristics of the landscape which provide aquifer recharge, flood protection, forests and riparian corridors, and they must protect headwater streams, and other sensitive areas. Used in association with planning for "green infrastructure," community systems will enable clustered development to provide enhanced protection of resource lands. Shared systems need to be considered as a possible strategy for successful local water and sewer plans.

Increased use of shared systems in priority funding areas could produce conflicts with local government capital improvement projects (CIP) planning and budgets. CIP includes

infrastructure for distribution and treatment at centralized municipal wastewater treatment plants to accommodate planned growth. An increase in shared systems within priority funding areas or designated growth areas could adversely affect the schedule for building and also the planned design of the distribution network to the centralized treatment plants and possibly their cost effectiveness. These potential conflicts must be evaluated in relation to long term environmental impacts. Centralized sewer and its replacement presents high costs to governments and citizens. It can also be environmentally degrading. It is thus important to evaluate the potential ecological and economic advantage of substituting non-traditional and shared systems for sewer in some areas.

Each jurisdiction has its own parameters for defining growth areas, and for some counties, these areas are very large in relation to the county's total area. New residences throughout such loosely defined growth areas, even if clustered on community systems, will require school and public safety services, and there will be accompanying environmental and economic impacts to provide these services farther and farther from core growth areas.

However, in rural counties with limited centralized sewer capacity, using shared instead of individual on-site disposal systems can retain desirable site features and preserve more desirable agricultural land in other areas. An example is the Marley Run development in Calvert County, where transfer of development rights from an agricultural area provided for increased density near the designated Town Center. The developer worked with local government agencies in preserving sensitive areas on the site, protecting agriculture elsewhere in the County, and providing community amenities within close proximity to limit driving and to build community spirit. The developer included nutrient reduction technologies in the shared on-site disposal system which was necessary to achieve the allowed lot yield on that site.

There needs to be a consistent policy statewide to define the distance (perhaps one mile) from a town center or other existing community unit in which the use of shared systems would be encouraged. This policy would apply to both existing and new lots of record. Without this limitation, it is recommended that clustered development with shared systems (and nutrient removal) be encouraged only within the priority funding areas and only when there will be no conflicts for planned sewer service.

Recommendations:

1. *County water and sewer plans should incorporate policies for utilizing shared facilities as an element of implementing their growth management/master plan. The plan would identify areas where shared facilities would be encouraged as well as areas where they would be discouraged.*

2. *MDE and local governments, including those that are involved in approving and managing shared facilities, should explore barriers to the use of these facilities -- including operations, maintenance and financial issues -- and identify options for making them more viable under Smart Growth guidelines.*

Concern 2: Shared systems require an organized management structure to assure long-term operation and maintenance.

Findings:
One reason for the limited use of shared systems in Maryland is that local governments are reluctant to take over the required maintenance of these types of systems and lack confidence that other independent management entities will be able to provide long-term service. Under current State regulations, a Controlling Authority must operate and maintain a shared system in perpetuity even if property owners refuse to pay costs. This creates a liability of unknown dimension for a controlling authority and provides no incentive for property owners to shoulder the financial responsibility for the system that serves them.

The State regulations do not specify any methods to ensure that individual owners pay their fair share of the operation and maintenance costs of a shared facility. Tax sales are cumbersome and are not available to all Controlling Authorities. Property liens are another remedy for nonpayment but are inefficient enforcement tools. Although the liens will be paid off if and when a property transfers, widespread nonpayment can result in insufficient operating funds for these very small systems. Another option is to cut off service to nonpaying property owners, but eliminating waste disposal can create a health hazard and is operationally difficult if not impossible in a shared system.

Recommendation:

3. MDE should require the establishment of management districts or maintenance agreements for shared systems. A framework with recommended options is included in Chapter 3.

Concern 3: Shared-use facilities may allow a greater number of residential units in one area and potential increased pollutant impacts from on-site systems in that area.

Findings:
Current State regulations do not require that shared systems use nutrient reduction technologies. The total load from the shared system disposal field provides a potential greater single impact on groundwater than individual homes with individual disposal fields and loads distributed over a greater area. The State regulations should be revised to require all shared systems to use nutrient reduction technologies to address concerns about total load impacts.

Recommendation:

4. Require nutrient reduction technologies for all new shared facilities.

Concern 4: Existing State regulations pertaining to community systems and shared-use facilities include apparent inconsistencies.

Findings:
Current State regulations refer to both multi-use and community systems. There is a need to review the existing language and revise where necessary to clarify differences and eliminate inconsistencies in how these two types of systems are defined and regulated.

Recommendation:

5. *Review the community facilities regulations and shared-use facility regulations and revise as necessary to remove inconsistencies.*

Using Our Green Infrastructure

One of the Task Force's goals is to make recommendations to reduce land consumption associated with On-site Sewage Disposal System (OSDS) in order to help protect valuable resource lands. By knowing where these lands are, local governments and State agencies can help protect and link them by directing growth elsewhere. When appropriately used, shared systems and non-traditional technologies can support this objective.

"Green Infrastructure" is a term used by the Departments of Natural Resources and the Environment to describe both the (1) land network to protect and link Maryland's remaining ecologically valuable lands, and the (2) environmental management infrastructure in place to support Smart Growth objectives. The land network would include, for example, large contiguous tracks of forest lands, important wildlife habitats, wetlands, riparian corridors and areas that reflect key elements of Maryland's biological diversity. The proposed land network would be linked by a system that connects large contiguous blocks of natural resource lands (hubs) through corridors that encompass the most ecologically valuable areas between these hubs (e.g. areas of high aquatic integrity, wetlands, wildlife migration routes and important forest lands). This concept is not a plan or a mandate to protect these valuable lands but rather it envisions the cooperative efforts of many people and organizations including government agencies, land trusts and interested private land owners.

The environmental management infrastructure includes wastewater treatment plants, water and sewer lines, stormwater management facilities. As local governments plan for growth, they are encouraged to use existing environmental management infrastructure in order to reduce costs and loss of the "green" infrastructure described above. The Task Force recommends that County Water and Sewer Plans address plans for OSDS more directly by incorporating policies for shared facilities as an element of implementing their master plan.

CHAPTER 8
FUTURE CHALLENGES

The Task Force met six times between February and July, and came to consensus on a wide range of policy recommendations summarized in this report. However, due to its short tenure, the Task Force identified several issues that were not resolved, and that will need future assessment and consideration. These issues, and the different perspectives surrounding them are summarized below in the hopes that this will assist future decision makers in understanding some of the complexities associated with them.

Impact of OSDS on growth patterns. The Task Force discussed at length the role of OSDS with respect to growth management. The group agreed that the availability of OSDS has contributed to sprawl development in the past, but others noted that OSDS are a part of Maryland's future and that not all growth can or should occur utilizing wastewater treatment plants. The Task Force expressed hope that future non-traditional technologies will provide options to reduce nutrients and pathogens from OSDS to negligible levels, and that they will be located in areas that will not contribute to unwanted growth.

More research is needed, the Chesapeake Bay Program's Land Growth and Stewardship Subcommittee is presently supporting a study entitled, "Literature Review, Investigation and Analysis of the Effects and Costs of Septic Systems within the Chesapeake Bay Watershed." This study, conducted by the Center for Watershed Protection, will be completed by May 2000, and will provide the following important information:

- research the relationship between septic systems and growth patterns in the Chesapeake Bay watershed;
- research septic system performance and use, including nutrient and non-nutrient failure impacts on water quality in groundwater and streams;
- Conduct a literature review on the direct (e.g. purchase and installation), indirect (e.g. monitoring and maintenance) and external (e.g. environmental and human health) costs associated with septic systems

Implementing Areas of Special Concern.
Many Task Force recommendations are wholly contingent on the Areas of Special concern being incorporated as a component of a County's Master Water and Sewer Plan. According to the Maryland Department of the Environment, the forthcoming Governor's Septic Systems Advisory Committee will identify a mechanism to institutionalize Areas of Special Concern. This will most likely be carried out through the regulatory framework of COMAR amendments, which will describe criteria and require local governments, to submit for approval, Master Water and Sewer Plans that establish Areas of Special Concern.

The Task Force did not discuss in detail how this pivotal process would occur but recognizes that it must occur if their recommendations are to go forward. For Areas of Special Concern to be successfully incorporated into planning schemes, both public and local government participation is paramount.
The implementation of Areas of Special concern portends a very complex land use scenario which is difficult to delineate or predict. The difficulties of defining and implementing these areas still needs more careful evaluation as to whether there is adequate data to define these areas well, and whether the complex issues and amount of effort involved make it worth creating this distinction. The interaction, effect, and equity of creating a landscape were the rules and costs of development vary according to whether an area is in or out of an Area of Special Concern is an open question. There is a need to more fully understand how Areas of Special Concern will either support or detract from Smart Growth objectives.

From an administrative and tracking point of view, it may be easier to mandate new OSDS technologies statewide, providing exemptions where required, rather than limiting them to Areas of Special Concern, but political leadership will be necessary to advance this position.

Future Use of Conventional Septic Systems. The Task Force discussed in detail the need to take special measures in Areas of Special Concern, but did not come to consensus on whether nutrient-reducing OSDS should be required or strongly encouraged in other parts of the State. Several members felt that conventional OSDS are outdated technology, and that non-traditional systems that reduce nutrients should be widely adopted. Others felt that there was not a sufficient justification for such action outside Areas of Special Concern. There was concern, however, that this approach was shortsighted, and that with unabated nutrient loading, over time, more and more watersheds would eventually become Areas of Special Concern.

Non-traditional systems may provide benefits that are seldom acknowledged but may be important as more and more habitat is lost. In consolidated growth areas, where habitat has been seriously diminished, and where there may be room to use a constructed wetland, these "earthsystems" could provide both a vital biological and an aesthetic function, while being less costly and longer lived. These types of urban retrofit technologies have recently been receiving wide attention and include constructed wetlands and rooftop greenways.

Future Use of Community and Shared Systems. The Task Force came to consensus on a core set of recommendations relating to shared systems, but raised several unresolved issues. There was considerable discussion regarding the use of OSDS, shared or community systems that could be used in planned sewer areas when a landowner/developer wished to proceed in advance of planned sewer availability. Currently, these properties are sometimes developed at lower than planned density to accommodate conventional OSDS. As a result, there are environmental impacts from conventional septic systems and the planned density for the property is not achieved. Furthermore, a great amount of time is required to plan and then receive elected official approval for infrastructure to accommodate planned growth. If one property owner or developer then moves ahead with an OSDS rather than waiting for sewer,

the schedule and funding rate then needs to be reassessed. It is not possible to predict which property owners are going to do this and facilitating shared systems in areas planned for sewer will certainly complicate long-term sewer planning. On the other hand, the desired density could be achieved using shared systems prior to sewer availability, obviating the need for such an installation at a later date. It is clear that to successfully accommodate alternative systems or new strategies that reduce nutrient loads and encourage clustering, some degree of complexity in environmental and infrastructure management will occur.

Environmental Benefits of OSDS versus Wastewater Treatment Plants. The Task Force discussed the relative merits of decentralized OSDS versus wastewater treatment plants in several contexts. Some members felt that biological nutrient removal at wastewater treatment plants is the most significant and tangible accomplishment of the Chesapeake Bay restoration effort within Maryland to-date, and that future growth should be directed toward these plants to the greatest extent possible. Other members expressed concern about the cost and disposal problems associated with centralized treatment, believing in the potential for non-traditional systems to provide local, high quality wastewater treatment and infiltration without the disturbances associated with sewer. There is a concern voiced by some, about all aspects of regional collection, whether it is stormwater, sewage waste or energy production and use. A trend toward smaller units of production and distribution may be better.

The impacts of both approaches on patterns of growth was discussed. While concentrating development on existing infrastructure serves to limit sprawl, extending sewer lines to serve communities with failing septic systems could spur unwanted growth. Likewise the use of non-traditional OSDS technologies could be used to justify dispersed development patterns and open up sensitive lands for building. The Task Force agreed on the need for local governments to explicitly address and consider OSDS and shared systems in their water and sewer plans so that these costs and benefits of both approaches can be analyzed on a site-specific basis.

Incentive-Based Approach. The Task Force was sensitive to the concerns of some from local government and industry that excessive regulations can hinder creative approaches to OSDS design, management and siting. Due to its short tenure, the Task Force did not have an opportunity to thoroughly explore the potential of non-regulatory approaches, but believes that they have great promise to promote the goal of reducing OSDS impacts. The Task Force is open to non-regulatory, incentive-based approaches that achieve the results included in these recommendations. However, participants were also aware of the potential of some incentive-based approaches to provide an unwanted incentive for OSDS in inappropriate areas. For example, while nutrient reducing systems are much preferred over conventional systems, the Task Force did not feel it was appropriate to pay property owners to install these systems because this could be used to promote development outside growth areas counter to Smart Growth objectives.

Impacts of Deep Trench Systems. Limited by time the Task Force did not address their concerns regarding deep trenches but felt that the impacts and use of this technology should be reviewed carefully. The Task Force was concerned about these systems, because they may

discharge directly into an unconsolidated soils, and are suspected of traveling easily, untreated, to the water table.

Monitoring and Assessment. The need to evaluate the extent of groundwater or surface water pollution resulting from OSDS was identified many times in the Task Force meetings. (Monitoring and assessments will also be needed in order to identify watersheds with suspected or probable OSDS impacts for designation as Areas of Special Concern.) It is interesting to note that of the persons assembled on the Task Force, no one was able to really elaborate on the extent of contamination from OSDS. Questions were plentiful. Is it just nitrate, what about phosphorus, pathogens, or other chemical contaminants? How long do they persist in groundwater, are they treated within the first 20 feet of soil around drain fields? What about "failed" systems, since some may be completely or partially "failed", what pollution load are they contributing? More monitoring and the assessment of the fate and transport of OSDS pollution loads is needed. Additionally, monitoring must be supported and conducted in various geologic regimes of the State.

Cumulative Impacts. The Task Force is aware that OSDS are only one of many nonpoint sources of pollution threatening local watersheds and the Chesapeake and Coastal Bays. An assessment of the environmental impacts of conventional OSDS on local watersheds is urgently needed, and should occur as part of the process of designating Areas of Special Concern. There is also a need to better quantify and understand the cumulative impacts of development, of the changes that occur as green areas and agricultural lands are converted to more intense uses.

The Task Force urges that a formal process be identified to assess the cumulative impacts of all pollutant sources to local watersheds. Such information is critical, and will help local governments make decisions about where to direct future growth, and how nutrient loads can be limited to meet the goals of the Chesapeake Bay and Coastal Bays Programs. However, it may take many years to design and implement studies that can adequately evaluate the complex interactions of waste management and natural systems. Justification for more immediate actions thus need to be based on our belief that the long term protection of living systems, critical unto itself, is also important in maintaining our own quality of life.

APPENDIX A
PROPOSED VERIFICATION PROCESS

Local approving agencies have expressed concerns about permitting non-traditional systems that will not meet expected operation or desired pollutant removal standards after installation. In addition, the current cost and increased maintenance requirements for these types of systems greatly reduces the likelihood that individual property owners will retrofit their conventional on-site disposal systems, even if education and financial incentives are provided. There is a need to institute a performance verification process which will promote the design of better and perhaps less expensive alternative systems while assuring that these new designs will meet standards to protect human health and the environment.

Two options are recommended to verify the performance of systems not currently approved for use within the State of Maryland. Both cover a two-year period of actual installation and performance monitoring at sites typical for these new systems. After the verification period, maintenance records and performance monitoring results will still need to be submitted to the local approving authority, at a frequency not to exceed more than once per year. The manufacturer/vendor requesting approval of these systems will need to post a performance bond to the local approving authority so that if the system does not work as desired, monies will be readily available to replace it with an alternative system that has proven performance.

The first option applies to non-traditional systems which have been certified for performance by nationally recognized accreditation organizations like the National Sanitation Foundation (NSF). The manufacturer has already invested time and money to have their system certified by an independent third party. This option requires the vendor to provide a mechanism to assure long-term maintenance and performance monitoring of any systems installed in the State.

The second option applies to innovative systems not already certified or proven to MDE's satisfaction and consequently having a greater possibility that desired performance standards or maintenance needs cannot be met. During the verification process, the manufacturer/vendor must hire an independent third-party operator to conduct performance monitoring and maintenance tracking. This third-party operator must be accepted by both MDE and the local approving authority and must be able to work with the homeowner/property owner during the test period to assure that the system is operated and maintained according to the manufacturer's recommendations. After the verification process is complete, the homeowner/property owner will take on the responsibility for routine maintenance and reporting.

SYSTEMS ALREADY CERTIFIED

1. The manufacturer or vendor must provide proof of third-party certification and document in writing the engineering and science behind the system to the satisfaction of MDE and the Environmental Health Directors.

2. During the first year of verification, no more than 50 systems will be permitted for installation. An approved third-party operator must monitor these systems every four months for pollutant removal performance and assure that the systems are being operated and maintained according to the manufacturer's recommendations. At any time during the verification period, if monitoring shows that installed systems are not performing as certified even though they are being operated and maintained as required, then the third-party operator must notify both the manufacturer/vendor and the local approving authority. Unless the vendor is able to correct the problem within 48 hours after it is reported, permitting and installation of additional systems will be immediately discontinued.

3. At the end of the first 12 months of the verification process, the manufacturer/vendor will submit the monitoring data, an analysis of data results, and a summary of operation and maintenance needs for the installed systems to MDE. If the first year of monitoring meets MDE's expected performance standards, then the local approving authority may permit up to 50 more systems during the second year of verification. These additional systems will also be monitored every four months.

4. After 100 units are installed and each has shown consistent performance for 24 months after installation, then MDE may approve these systems for unlimited installation in the State. Performance monitoring will be reduced to once every 6 months for each system installed.

5. After five years of installing and successful testing of these systems, then performance monitoring for these types of systems can be reduced to once every 12 months for each system installed. To assure consistency when comparing results, MDE and the local approving authority will determine the interval of the year, perhaps season, for conducting the annual performance monitoring.

6. The vendor or an approved third-party operator should perform maintenance checks every four months for the life of these systems. If maintenance or performance problems are identified during these maintenance checks, then the system user and the local approving authority should be notified, and the problem corrected within 48 hours after its identification.

INNOVATIVE SYSTEMS NOT ALREADY CERTIFIED

1. The manufacturer or vendor must document in writing the engineering and science behind the new system to the satisfaction of MDE and the Environmental Health Directors.

2. MDE will allow five of the alternative systems to be installed during year 1 of testing.

3. For 24 months after installation, MDE will require monthly monitoring by an independent third-party operator to document pollutant removal to the concentrations attested by the manufacturer/vendor. MDE will also require that the manufacturer/vendor provide a written record of operation and maintenance needs for these systems during the test period.

The manufacturer/vendor will submit all monitoring data, records of systems operation and maintenance, and results interpretation to MDE and the local approving authority in two reports: an interim report after 12 months and then a final report after 24 months of monitoring.

4. At any time during the verification period, if monitoring shows that installed systems are not performing as certified even though they are being operated and maintained as required, then the third-party operator must notify both the manufacturer/vendor and the local approving authority. If the manufacturer/vendor cannot correct the problem within 48 hours after it is reported, permitting and installation of additional systems will be immediately discontinued. If the problem can be corrected but will require significant design changes, then the modified system will be treated as a new design and the manufacturer/vendor will need to begin with Step 1 of the verification process to test the modified designs.

5. If the manufacturer/vendor fails to submit reports as required, then permitting of additional systems of this type will be immediately discontinued. After the delinquent reports are submitted, MDE and the local approving authority will determine when permitting of additional systems of this type will resume.

6. MDE will work with the local approving authority during review of submitted reports on the five test systems and the results from the 24 months of monthly monitoring. MDE and the local approving authority will provide written approval/disapproval of approval to use these systems within 30 days after submission of the final report.

7. After 24 months of monthly monitoring, performance monitoring will continue on a quarterly basis. The homeowner/property owner will then assume responsibility for hiring an approved operator to conduct monitoring and for assuring that accurate records on monitoring, operation, and maintenance of the system are submitted to the local approving authority as required.

APPENDIX B
A PARTIAL LISTING OF SOME NON-TRADITIONAL On-site Sewage Disposal System (OSDS)

Aerobic treatment systems provide extended aeration of wastewater to expedite biochemical oxidation. Forced air diffusion or mechanical aeration is followed by clarification, biomass may be separated from treated wastewater, a portion of which may be recycled back to the aeration chamber.

Constructed wetlands systems are engineered, constructed marsh areas, designed to replicate patterns that occur in nature, and operate to treat wastewater by optimizing the physical, chemical, and biological processes found in natural ecosystems. Design variations may be "free flowing water surface wetlands" or "sub-surface flow wetlands". They may provide the greatest removal of BOD, suspended solids, and nitrogen. These systems are particularly noteworthy because since they are patterned after natural functions, they work to recycle, reuse and reduce water by cleaning and reintroducing it (in some cases) into aquifers rather than into streams or into the Bay. They can also reintroduce needed habitat and create an aesthetic contribution to the landscape.

Composting systems, such as the "Clivus Multrum" composting toilet, are waterless toilets that provide an evaporative surface area with an aerobic decomposition chamber followed by a collection chamber.

Drip irrigation systems may be simple, gravity dosed soil absorption systems or complex high pressure pumped systems with valves, pumps, filters, meters and micro processors programed to monitor, report, and control most system functions. The system utilizes the distribution of effluent to vegetative root zones. This system may provide the ability to conserve and reclaim water. These systems are used in conjunction with the septic tank and or a sand filter and are used in areas unacceptable for conventional on-site systems.

Living machines process wastewater from industrial and municipal wastes. Modeled on natural systems, they link anaerobic reactors, open aerobic reactors, clarifiers, divers organisms and plants in a greenhouse. The final fluidized beds produce high quality water suitable for use. The systems are odor free and aesthetically pleasing.

Peat biofilters systems are OSDS that treat septic tank effluent before it percolates to the natural soil using biofibrous peat as the media.

Sand filter systems are OSDS with a shallow (24 - 36 inches) bed of sand, filter wastewater effluent prior to discharge in a soil absorption disposal trench or bed. Under drains collect and discharge the final effluent. Various configurations exist. Gravel may also be used instead of sand. Recirculating sand filters (RSF) are designed to recirculate nitrified effluent to improve denitrification.

Sand mound filter systems are pressure dosed soil absorption systems, elevated above the natural soil surface with a sand fill. Site constraints such as low permeable or shallow soils, high watertables, or bedrock which may preclude a conventional drain field may be suitable for these systems. Various configurations exist. The system consists of septic tank, dosing chamber, and elevated mound.

APPENDIX C
GLOSSARY

Areas of Special Concern - Areas throughout the state that urgently need additional protection to reduce nitrogen entering groundwater or nearby waterways. Local jurisdictions will be designating these areas through their water and sewer planning process with guidance from MDE. See text for Task Force's recommended guidelines.

BNR - Biological nutrient removal (BNR), a microbial driven process, used to reduce the amount of nitrogen from wastewater effluent in sewage treatment plants.

COMAR - Code of Maryland Regulations

community systems - On-site sewage disposal systems in which responsibility for routine maintenance is distributed over more than one property owner. Community systems may include systems that are shared or systems that are not shared. (See shared systems).

denitrification - The biological or chemical reduction of nitrate (NO3+) to nitrite (NO2+) to volatile gases, usually nitrous oxide (NO) and molecular nitrogen (N2) or both.

management districts - Management districts and management agreements are mechanisms that may provide the coordinated financial management, education, inspections, oversight, and follow-up, necessary to ensure the proper maintenance and function of OSDS units.

non-traditional OSDS - Any system which is not conventional, including but not limited to elevated sand mounds, intermittent sand filters, recirculating sand filters, gravel filters, recirculating gravel filters, aerobic treatment systems, and peat bio-filters. These systems may treat and or remove BOD, TSS, TKN, TN, TP, and fecal coliform to a greater degree than conventional systems. *This report focuses on the performance assurance and application of non-traditional technologies* ***that also reduce nutrient pollution***. [MDE recognizes non-conventional technologies as those systems for which siting and design criteria are being developed and evaluated. For MDE, non-traditional systems may be innovative or alternative, but this does not necessarily imply nutrient reduction capabilities. For MDE, alternative systems are "transitional" toward becoming conventional. Innovative systems are experimental and are restricted in their application.]

nitrification - The biological conversion of nitrogen from a reduced to a more oxidized state. (NH4+ towards NO2- towards NO3-).

OSDS - On-site sewage disposal system (OSDS). May be any one of a number of configurations designed to remove or hold some or all components of wastewater including:

pathogens, liquids, solids, and/or nutrients. OSDS may include both conventional or non-traditional systems.

shared systems - A subset of community systems, where the infrastructure used for sewage treatment and disposal is shared by more than one property.

SRF - State Revolving Funds

APPENDIX D
SURVEY OF HEALTH DEPARTMENTS